

codiles. 1, I.U.C.N. Publs. N.S. Suppl. Pap. No. 32: 166-180.

LOVERIDGE, A. (1946): Reptiles of the Pacific World. New York, Macmillan.

LYDEKKER, R. (1896): The Royal Natural History. Vol. V, Frederick Warne & Co., London and New York, pp. 22-24.

OGDEN, J. AND SINGLETARY, C. (1973): Nights of the Crocodile. *Audubon* 75(3): 32-37.

SINGH, L. A. K. AND BUSTARD, H. R. (1977): Studies on the Indian Gharial (*Gavialis gangeticus*, Gmelin) (Reptilia, crocodilia), V: preliminary ob-

servations on material behaviour. *Ind. Forester*, 103 (10): 671-678.

SMITH, M. A. (1931): The Fauna of British India. Reptilia and Amphibia. 1. Taylor and Francis, London, pp. 42-44.

WEBB, G. J. W., MESSEL, H. AND MAGNUSSEN, W. (1977): The Nesting of *Crocodylus porosus* in Arnhem Land, Northern Australia. *Copeia* 1977 (2): 238-250.

YANGPRAPAKORN, U. (1971): Captive breeding of crocodiles in Thailand. *Crocodyles*, 1, I.U.C.N. Publs. N.S. Suppl. Pap. No. 32: 98-101.

20. MATERNAL BEHAVIOUR IN THE GHARIAL [*GAVIALIS GANGETICUS* (GMELIN)]

(With a text-figure)

INTRODUCTION

Observations have been made in recent years on aspects of maternal behaviour in various species of crocodilians (see Singh and Bustard 1977, and Bustard 1980, for references). Singh and Bustard recorded nest-guarding in the gharial and noted that a female's visits to the actual nesting site occurred around the time of anticipated hatching. Singh and Bustard assumed that the female's presence indicated her intention to assist the hatching process by digging up the nest, (a view corroborated by the fact that hatchling gharial break the egg shell, protrude the head, and remain in this position calling intermittently until the nest is opened (Bustard *et al.* in prepn.), however, no actual data were recorded on this topic. Singh and Bustard were of the view that due to morphological limitations—the gharial's greatly elongated jaws, the location of the eyes and the piercing tooth type—the gharial would not be able to pick-up and convey the hatchlings from the nest to the water.

Bustard (1980) reported post-natal care

lasting many weeks in the gharial.

OBSERVATIONS AND DISCUSSION

We confirm that the gharial does excavate the nest on the basis of observations which occurred during the night of 9/10 June 1978 in Chambal River, North India. A gharial nest was intact at midnight on the 9th June. At 0500 hours on 10 June there was a well-marked saucer-shaped excavation measuring $2.57 \times 2.10 \times 0.4$ m deep with tracks of a large gharial between the water and the excavation (Figure 1). The distance from the centre of the excavation to the water was 10.7 m and the height of the nest above the water was 1.48 m. On the basis of scute length observations using the technique of Bustard and Singh (1977) the length of the female was estimated as 3.4 m.

Twenty-nine hatchlings were recovered from the water and further excavation of the nest disclosed the presence of another 16 still within the nest. Forty-five eggshells were present indicating a 100% hatch. We presume that had we not been present, the mother would

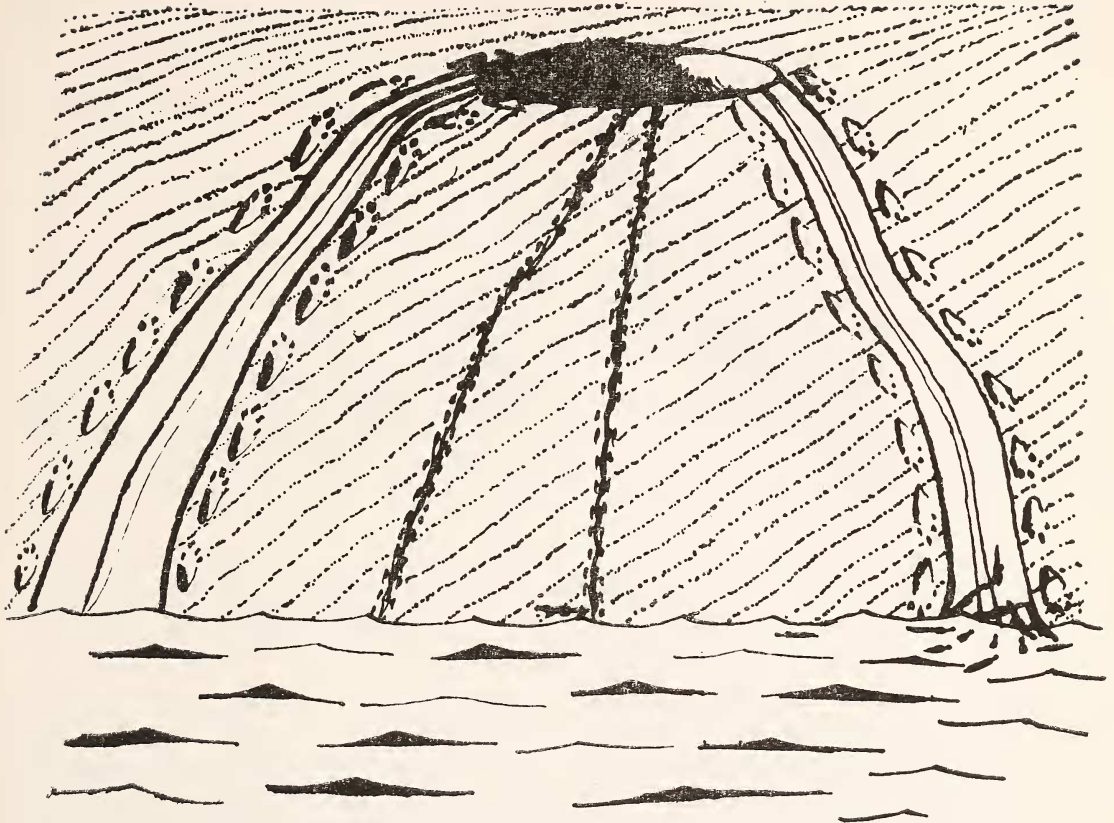


Fig. 1. Visual impressions of the excavation, tracks of a large gharial, presumably a female, between a disturbed area around the nest and the river and two clear tracks of hatchling gharial leading from the nest site to the river.

have returned to the nest in the early morning and excavated it further.

Apart from the belly slide of the female only 2 hatchling spoor marks were visible (Figure 1). (The very fine sand leaves excellent impressions even of animals of the size of a 2 cm beetle.) This strongly suggests to us that the female gharial took the young to the water. Such a view contrasts with that expressed by Singh and Bustard (1977) who considered the long snout, the location of the eyes, and the tooth type of the gharial were unsuited for picking up and holding the

hatchlings uninjured.

If the hatchlings were not carried within the mother's mouth, they may perhaps have been carried on her body or moved closely beside her and their spoor obliterated by her belly slide. However, in the latter instance, it seems highly unlikely that there would be no traces of spoor from individuals which had moved outside the area of her belly slide. We therefore, conclude that the hatchlings were most likely carried to the water in the mother's mouth.

KUKRAIL MANORANJAN VAN,
GAZIPUR,
LUCKNOW 226 010.

D. BASU

CENTRAL CROCODILE BREEDING &
MANAGEMENT TRAINING INSTITUTE,
RAJENDRANAGAR ROAD,
HYDERABAD 500 264,
January 3, 1981.

H. R. BUSTARD

REFERENCES

- BUSTARD, H. R. (1980): Maternal Care in the Gharial (*Gavialis gangeticus* (Gmelin)). *British Journal of Herpetology* 6(2): 63-64.
- BUSTARD, H. R. & SINGH, L. A. K. (1977): Studies on the Indian gharial *Gavialis gangeticus* (Gmelin) (Reptilia, Crocodilia)—I. Estimation of body length from scute length. *Indian Forester* 103 (2): 140-149.
- SINGH, L. A. K. & BUSTARD, H. R. (1977): Studies on the Indian gharial (*Gavialis gangeticus* (Gmelin) (Reptilia, Crocodilia)—V. Preliminary Observations on Maternal Behaviour. *Indian Forester* 103(10): 671-678.

21. GROWTH RECORDS OF GRASS CARP, *CTENOPHARYNGODON IDELLA* VAL. FROM RANKALA TANK, KOLHAPUR

Introduction of Grass Carp, *Ctenopharyngodon idella* Val. in weed infested water bodies has proved to be very successful as a weed control measure, the world over. According to Nikolskii (1956), the juveniles of grass carp bigger than 30 mm in length are almost herbivorous feeding mainly on aquatic macrophytes. The fish eats food as much as above 25% to 50% of its body weight every day in the warm climates, (Woynarovich 1975). Similar example of voluminous feeding and excellent rate of growth has been reported from a tank known as Rankala at Kolhapur in Maharashtra.

The Rankala tank has a thick growth of a large number of submerged, rooted, emergent and floating macrophytes. The phytoplankton is also rich in quantity and quality. The more common forms found in the tank are different species of *Vallisneria*, *Eichhornia*, *Pistia*, *Lemna*, *Wolffia*, *Nymphaea*, *Nymphoides*,

Hydrilla, *Najas*, *Potamogeton*, *Typha*, *Ipomoea*, *Eleocharis*, etc. out of which *Hydrilla* and *Vallisneria* are commonest. The endemic fauna of the tank is also quite rich and the fishes like *Chela phulo* (Ham.), *Danio aequipinnatus* (McClelland), *Rasbora daniconius* (Ham.), *Puntius kolus* (Sykes), *Garra mullya* (Sykes), *Labeo calbasu* (Ham.), *Labeo porcellus* (Hackel), *Rohtee vigorsii* (Sykes), *Noemacheilus botius* (Ham.), *Ompok bimaculatus* (Bl.), *Mystus cavasius* (Ham.), *Mystus malabaricus* (Jerdon), *Mystus seenghala* (Sykes), *Wallago attu* (Bl.), *Channa gachua* (Ham.), *Channa marulius* (Ham.) and *Glossogobius giuris* (Ham.) are frequently caught.

To observe the effect of grass carp on the aquatic vegetation of the tank, about 2000 grass carp fingerlings of 6 to 7 cm length were introduced in the tank in September 1976 by the local fisheries department. In order to study growth and rate of survival of the in-